

Preliminary Classification:  
Proposed Class:  
Subclass:

NOTE: "All applicants are requested to include a preliminary classification on newly filed patent applications. The preliminary classification, preferably class and subclass designations, should be identified in the upper right-hand corner of the letter of transmittal accompanying the application papers, for example 'Proposed Class 2, subclass 129.'" M.P.E.P. Section 601, 7th ed.

JC992 U.S. PTO  
09/642119  
08/21/00

## IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Box Patent Application  
Assistant Commissioner for Patents  
Washington, D.C. 20231

Optional Customer No. Bar Code

## NEW APPLICATION TRANSMITTAL

Transmitted herewith for filing is the patent application of  
Inventor(s):

1. SCOTT WILLIAM KING
2. RICHARD FREYER

**WARNING:** 37 C.F.R. Section 1.41(a)(1) points out:

*"(a) A patent is applied for in the name or names of the actual inventor or inventors.*

*(1) The inventorship of a nonprovisional application is that inventorship set forth in the oath or declaration as prescribed by Section 1.63, except as provided for in Section 1.53(d)(4) and Section 1.63(d). If an oath or declaration as prescribed by Section 1.63 is not filed during the pendency of a nonprovisional application, the inventorship is that inventorship set forth in the application papers filed pursuant to Section 1.53(b), unless a petition under this paragraph accompanied by the fee set forth in Section 1.17(I) is filed supplying or changing the name or names of the inventor or inventors."*

For (title): MICRO WAVE CELLULAR ARCHITECTURE

## CERTIFICATION UNDER 37 C.F.R. 1.10\*

*(Express Mail label number is mandatory.)*

*(Express Mail certification is optional.)*

I hereby certify that this correspondence and the documents referred to as attached therein are being deposited with the United States Postal Service on this date August 21, 2000, in an envelope as "Express Mail Post Office to Addressee", mailing Label Number EL699731075US, addressed to the Assistant Commissioner for Patents, Washington, D.C. 20231.

CONNIE YANNOTTI

*(type or print name of person mailing paper)*

*Signature of person mailing paper*

**WARNING:** Certificate of mailing (first class) or facsimile transmission procedures of 37 C.F.R. 1.8 cannot be used to obtain a date of mailing or transmission for this correspondence.

**\*WARNING:** Each paper or fee filed by "Express Mail" **must** have the number of the "Express Mail" mailing label placed thereon prior to mailing. 37 C.F.R. 1.10(b).  
"Since the filing of correspondence under § 1.10 without the Express Mail mailing label thereon is an oversight that can be avoided by the exercise of reasonable care, requests for waiver of this requirement will **not** be granted on petition." Notice of Oct. 24, 1996, 60 Fed. Reg. 56,439, at 56,442.

**EXPRESS MAIL LABEL**  
**NO.: EL699731075US**

(New Application Transmittal--page 1 of 12) 4-1

## 1. Type of Application

This new application is for a(n)

*(check one applicable item below)*

- ☐ Original (nonprovisional)
- ☐ Design
- ☐ Plant

**WARNING:** *Do not use this transmittal for a completion in the U.S. of an International Application under 35 U.S.C. 371(c)(4), unless the International Application is being filed as a divisional, continuation or continuation-in-part application.*

**WARNING:** *Do not use this transmittal for the filing of a provisional application.*

**NOTE:** If one of the following 3 items apply, then complete and attach ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF A PRIOR U.S. APPLICATION CLAIMED and a NOTIFICATION IN PARENT APPLICATION OF THE FILING OF THIS CONTINUATION APPLICATION.

- ☐ Divisional.
- ☒ Continuation.
- ☐ Continuation-in-part (C-I-P).

## 2. Benefit of Prior U.S. Application(s) (35 U.S.C. Sections 119(e), 120, or 121)

**NOTE:** *A nonprovisional application may claim an invention disclosed in one or more prior filed copending nonprovisional applications or copending international applications designating the United States of America. In order for a nonprovisional application to claim the benefit of a prior filed copending nonprovisional application or copending international application designating the United States of America, each prior application must name as an inventor at least one inventor named in the later filed nonprovisional application and disclose the named inventor's invention claimed in at least one claim of the later filed nonprovisional application in the manner provided by the first paragraph of 35 U.S.C. Section 112. Each prior application must also be:*

- (i) An international application entitled to a filing date in accordance with PCT Article 11 and designating the United States of America; or*
- (ii) Complete as set forth in Section 1.51(b); or*
- (iii) Entitled to a filing date as set forth in Section 1.53(b) or Section 1.53(d) and include the basic filing fee set forth in Section 1.16; or*
- (iv) Entitled to a filing date as set forth in Section 1.53(b) and have paid therein the processing and retention fee set forth in Section 1.21(l) within the time period set forth in Section 1.53(f).*

*37 C.F.R. Section 1.78(a)(1).*

**NOTE** *If the new application being transmitted is a divisional, continuation or a continuation-in-part of a parent case, or where the parent case is an International Application which designated the U.S., or benefit of a prior provisional application is claimed, then check the following item and complete and attach ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION(S) CLAIMED.*

**WARNING:** *If an application claims the benefit of the filing date of an earlier filed application under 35 U.S.C. 120, 121 or 365(c), the 20-year term of that application will be based upon the filing date of the earliest U.S. application that the application makes reference to under 35 U.S.C. 120, 121 or 365(c). (35 U.S.C. 154(a)(2) does not take into account, for the determination of the patent term, any application on which priority is claimed under 35 U.S.C. 119, 365(a) or 365(b).) For a c-I-p application, applicant should review whether any claim in the patent that will issue is supported by an earlier application and, if not, the applicant should consider canceling the reference to the earlier filed application. The term of a patent is not based on a claim-by-claim approach. See Notice of April 14, 1995, 60 Fed. Reg. 20,195, at 20,205.*

**WARNING:** *When the last day of pendency of a provisional application falls on a Saturday, Sunday, or Federal holiday within the District of Columbia, any nonprovisional application claiming benefit of the provisional application **must** be filed prior to the Saturday, Sunday, or Federal holiday within the District of Columbia. See 37 C.F.R. Section 1.78(a)(3).*

☒ The new application being transmitted claims the benefit of prior U.S. application(s).  
Enclosed are ADDED PAGES FOR NEW APPLICATION TRANSMITTAL  
WHERE BENEFIT OF PRIOR U.S. APPLICATION(S) CLAIMED.

### 3. Papers Enclosed

**A. Required for Filing Date under 37 C.F.R. Section 1.53(b) (Regular) or 37 C.F.R. Section 1.153 (Design) Application**

10 Pages of Specification  
5 Pages of Claims  
14 Sheets of Drawing

**WARNING:** ***DO NOT** submit original drawings. A high quality copy of the drawings should be supplied when filing a patent application. The drawings that are submitted to the Office must be on strong, white, smooth, and non-shiny paper and meet the standards according to Section 1.84. If corrections to the drawings are necessary, they should be made to the original drawing and a high-quality copy of the corrected original drawing then submitted to the Office. Only one copy is required or desired. For comments on proposed then-new 37 C.F.R. 1.84, see Notice of March 9, 1988 . (1990 O.G. 57-62).*

**NOTE:** *"Identifying indicia, if provided, should include the application number or the title of the invention, inventor's name, docket number (if any), and the name and telephone number of a person to call if the Office is unable to match the drawings to the proper application. This information should be placed on the back of each sheet of drawing a minimum distance of 1.5 cm. (5/8 inch) down from the top of the page. . ." 37 C.F.R. Section 1.84(c)).*

*(complete the following, if applicable)*

☐ The enclosed drawing(s) are in color, and there is also attached a "PETITION TO ACCEPT COLOR DRAWING(S)." 37 C.F.R. Section 1.84(b).

☒ Formal  
☐ Informal

**B. Other Papers Enclosed**

\_\_\_\_ Pages of declaration and power of attorney

  1   Pages of Abstract

\_\_\_\_ Other

**4. Additional Papers Enclosed**

☐ Amendment to claims

☐ Cancel in this applications claims \_\_\_\_\_ before calculating the filing fee.  
(At least one original independent claim must be retained for filing purposes.)

☐ Add the claims shown on the attached amendment. (Claims added have been numbered consecutively following the highest numbered original claims.)

☒ Preliminary Amendment

☐ Information Disclosure Statement (37 C.F.R. Section 1.98)

☐ Form PTO-1449 (PTO/SB/08A and 08B)

☐ Citations

☐ Declaration of Biological Deposit

☐ Submission of "Sequence Listing," computer readable copy and/or amendment pertaining thereto for biotechnology invention containing nucleotide and/or amino acid sequence.

☐ Authorization of Attorney(s) to Accept and Follow Instructions from Representative

☐ Special Comments

☐ Other

**5. Declaration or Oath (including power of attorney)**

*NOTE: A newly executed declaration is not required in a continuation or divisional application provided the prior nonprovisional application contained a declaration as required, the application being filed is by all or fewer than all the inventors named in the prior application, there is no new matter in the application being filed, and a copy of the executed declaration filed in the prior application (showing the signature or an indication thereon that it was signed) is submitted. The copy must be accompanied by a statement requesting deletion of the names of person(s) who are not inventors of the application being filed. If the declaration in the prior application was filed under Section 1.47 then a copy of that declaration must be filed accompanied by a copy of the decision granting Section 1.47 status or, if a nonsigning person under Section 1.47 has subsequently joined in a prior application, then a copy of the subsequently executed declaration must be filed. See 37 C.F.R. Section 1.63(d)(1)-(3).*

*NOTE: A declaration filed to complete an application must be executed, identify the specification to which it is directed, identify each inventor by full name, including the family name, and at least one given name without abbreviation together with any other given name or initial, and the residence, post office address and country of citizenship of each inventor, and state whether the inventor is a sole or joint inventor. 37 C.F.R. Section 1.63(a)(1)-(4).*

*NOTE: A The inventorship of a nonprovisional application is that inventorship set forth in the oath or declaration as prescribed by Section 1.62, except as provided for in Section 1.53(d)(4) and Section 1.63(d). If an oath or declaration as prescribed by Section 1.63 is not filed during the pendency of a nonprovisional application, the inventorship is that inventorship set forth in the application papers filed pursuant to Section 1.53(b), unless a petition under this paragraph accompanied by the fee set forth in Section 1.17(l) is filed supplying or changing the name or names of the inventor or inventors. 37 C.F.R. Section 1.41(a)(1).*

☐ Enclosed

Executed by

*(check all applicable boxes)*

- ☐ inventor(s).  
☐ legal representative of inventor(s). 37 C.F.R. Section 1.42 or 1.43.  
☐ joint inventor or person showing a proprietary interest on behalf of inventor who refused to sign or cannot be reached.

☐ This is the petition required by 37 C.F.R. Section 1.47 and the statement required by 37 C.F.R. Section 1.47 is also attached. See item 13 below for fee.

☒ Not Enclosed.

**NOTE:** *Where the filing is a completion in the U.S. of an International Application, or where the completion of the U.S. application contains subject matter in addition to the International Application, the application may be treated as a continuation or continuation-in-part, as the case may be, utilizing ADDED PAGE FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION CLAIMED.*

☒ Application is made by a person authorized under 37 C.F.R. 1.41 on behalf of *all* the above named inventor(s).

*(The declaration or oath, along with the surcharge required by 37 C.F.R. Section 1.16(e), can be filed subsequently).*

☐ Showing that the filing is authorized.  
*(not required unless called into question. 37 C.F.R. Section 1.41(d))*

## 6. Inventorship Statement

**WARNING:** *If the named inventors are each not the inventors of all the claims an explanation, including the ownership of the various claims at the time the last claimed invention was made, should be submitted.*

The inventorship for all the claims in this application are:

☐ The same.

**or**

- ☐ Not the same. An explanation, including the ownership of the various claims at the time the last claimed invention was made,  
☐ is submitted.  
☐ will be submitted.

## 7. Language

**NOTE:** An application including a signed oath or declaration may be filed in a language other than English. An English translation of the non-English language application and the processing fee of \$130.00 required by 37 C.F.R. Section 1.17(k) is required to be filed with the application, or within such time as may be set by the Office. 37 C.F.R. Section 1.52(d).

☒ English  
☐ Non-English

☐ The attached translation includes a statement that the translation is accurate.  
37 C.F.R. Section 1.52(d).

## 8. Assignment

☐ An assignment of the invention to \_\_\_\_\_

☐ is attached. A separate ☐ "COVER SHEET FOR ASSIGNMENT (DOCUMENT) ACCOMPANYING NEW PATENT APPLICATION" or ☐ FORM PTO 1595 is also attached.

☐ will follow.

☐ has been recorded at Reel \_\_\_\_\_, Frame \_\_\_\_\_ on \_\_\_\_\_

**NOTE:** "If an assignment is submitted with a new application, send two separate letters-one for the application and one for the assignment" Notice of May 4, 1990 (1114 O.G. 77-78).

**WARNING:** A newly executed "STATEMENT UNDER 37 C.F.R. Section 3.73(b)" must be filed when a continuation-in-part application is filed by an assignee. Notice of April 30, 1993, 1150 O.G. 62-64.

## 9. Certified Copy

Certified copy(ies) of application(s)

Country	Appln. no.	Filed
Country	Appln. no.	Filed
Country	Appln. no.	Filed

from which priority is claimed

☐ is (are) attached.

☐ will follow.

☐ was filed in parent application \_\_\_\_\_

**NOTE:** The foreign application forming the basis for the claim for priority must be referred to in the oath or declaration. 37 C.F.R. Section 1.55(a) and 1.63.

**NOTE:** This item is for any foreign priority for which the application being filed directly relates. If any parent U.S. application or International Application from which this application claims benefit under 35 U.S.C. 120 is itself entitled to priority from a prior foreign application, then complete item 18 on the ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION(S) CLAIMED.

10. **Fee Calculation** (37 C.F.R. Section 1.16)

A. ☒ Regular application

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CLAIMS AS FILED

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Claims	Number Filed	Basic Fee Allowance	Number Extra	Rate	Basic Fee 37 C.F.R. Section 1.16(a)
Total Claims (37 C.F.R. Section 1.16(c))	24	- 20 =	4 x	\$ 18.00	\$690.00 72.00

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Independent Claims (37 C.F.R. Section 1.16(b))	2	- 3 =	x	\$ 78.00
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Multiple Dependent Claim(s), if any (37 C.F.R. Section 1.16(d))			+	\$260.00
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- ☐ Amendment cancelling extra claims is enclosed.  
☐ Amendment deleting multiple-dependencies is enclosed.  
☐ Fee for extra claims is not being paid at this time.

*NOTE: If the fees for extra claims are not paid on filing they must be paid or the claims cancelled by amendment, prior to the expiration of the time period set for response by the Patent and Trademark Office in any notice of fee deficiency. 37 C.F.R. Section 1.16(d).*

Filing Fee Calculation \$ 762.00

B. ☐ Design application  
(\$310.00--37 C.F.R. Section 1.16(f))  
Filing Fee Calculation \$ \_\_\_\_\_

C. ☐ Plant application  
(\$480.00--37 C.F.R. Section 1.16(g))  
Filing Fee Calculation \$ \_\_\_\_\_

**11. Small Entity Statement(s)**

- ☐ Statement(s) that this is a filing by a small entity under 37 C.F.R. Section 1.9 and 1.27 is (are) attached.

**WARNING:** *"Status as a small entity must be specifically established in each application or patent in which the status is available and desired. Status as a small entity in one application or patent does not affect any other application or patent, including applications or patents which are directly or indirectly dependent upon the application or patent in which the status has been established. The refiling of an application under Section 1.53 as a continuation, division, or continuation-in-part (including a continued prosecution application under Section 1.53(d)), or the filing of a reissue application requires a new determination as to continued entitlement to small entity status for the continuing or reissue application. A nonprovisional application claiming benefit under 35 U.S.C. 119(e), 120, 121, or 365(c) of a prior application, or a reissue application may rely on a statement filed in the prior application or in the patent if the nonprovisional application or the reissue application includes a reference to the statement in the prior application or in the patent or includes a copy of the statement in the prior application or in the patent and status as a small entity is still proper and desired. The payment of the small entity basic statutory filing fee will be treated as such a reference for purposes of this Section." 37 C.F.R. Section 1.28(a)(2).*

**WARNING:** *"Small entity status must not be established when the person or persons signing the . . . statement can unequivocally make the required self-certification." M.P.E.P. Section 509.03, 6th ed., rev. 2, July 1996 (emphasis added).*

*(complete the following, if applicable)*

- ☐ Status as a small entity was claimed in prior application \_\_\_\_\_, filed on \_\_\_\_\_ from which benefit is being claimed for this application under:

35 U.S.C. Section      ☐ 119(e) - provisional,  
                                 ☐ 120 - continuation,  
                                 ☐ 121 divisional,  
                                 ☐ 365(c) - PCT,

and which status as a small entity is still proper and desired.

- ☐ A copy of the statement in the prior application is included.

Filing Fee Calculation (50% of A, B or C above)      \$ \_\_\_\_\_

**NOTE:** *Any excess of the full fee paid will be refunded if a small entity status is established refund request are filed within 2 months of the date of timely payment of a full fee. The two-month period is not extendable under Section 1.136. 37 C.F.R. Section 1.28(a).*

**12. Request for International-Type Search (37 C.F.R. Section 1.104(d))**

*(complete, if applicable)*

- ☐ Please prepare an international-type search report for this application at the time when national examination on the merits takes place.



**13. Fee Payment Being Made at This Time**

☒ Not Enclosed

☒ No filing fee is to be paid at this time.  
(This and the surcharge required by 37 C.F.R. Section 1.16(e) can be paid subsequently.)

☐ Enclosed

☐ Filing fee \$ \_\_\_\_\_

☐ Recording assignment  
(\$40.00; 37 C.F.R. Section 1.21(h))  
(See attached "COVER SHEET FOR  
ASSIGNMENT ACCOMPANYING NEW  
APPLICATION.") \$ \_\_\_\_\_

☐ Petition fee for filing by other  
than all the inventors or person  
on behalf of the inventor where  
inventor refused to sign or cannot  
be reached  
(\$130.00; 37 C.F.R. Sections 1.47 and 1.17(I)) \$ \_\_\_\_\_

☐ For processing an application with a  
specification in a non-English language  
(\$130.00; 37 C.F.R. Sections 1.52(d) and 1.17(k)) \$ \_\_\_\_\_

☐ Processing and retention fee  
(\$130.00; 37 C.F.R. Sections 1.53(d) and 1.21(l)) \$ \_\_\_\_\_

☐ Fee for international-type search report  
(\$40.00; 37 C.F.R. Section 1.21(e)) \$ \_\_\_\_\_

NOTE: 37 C.F.R. Section 1.21(l) establishes a fee for processing and retaining any application that is abandoned for failing to complete the application pursuant to 37 C.F.R. Section 1.53(f) and this, as well as the changes to 37 C.F.R. Section 1.53 and 1.78(a)(1), indicate that in order to obtain the benefit of a prior U.S. application, either the basic filing fee must be paid, or the processing and retention fee of Section 1.21(l) must be paid, within 1 year from notification under Section 53(f).

Total Fees Enclosed \$ \_\_\_\_\_

**14. Method of Payment of Fees**

- ☐ Check in the amount of \$\_\_\_\_\_.
- ☐ Charge Account No. \_\_\_\_\_ in the amount of \$\_\_\_\_\_.  
A duplicate of this transmittal is attached.

*NOTE: Fees should be itemized in such a manner that it is clear for which purpose the fees are paid. 37 C.F.R. Section 1.22(b).*

**15. Authorization to Charge Additional Fees**

**WARNING:** *If no fees are to be paid on filing, the following items should not be completed.*

**WARNING:** *Accurately count claims, especially multiple dependent claims, to avoid unexpected high charges, if extra claim charges are authorized.*

- ☐ The Commissioner is hereby authorized to charge the following additional fees by this paper and during the entire pendency of this application to Account No.\_\_\_\_\_.
- ☐ 37 C.F.R. Section 1.16(a), (f) or (g) (filing fees)
- ☐ 37 C.F.R. Section 1.16(b), (c) and (d) (presentation of extra claims)

*NOTE: Because additional fees for excess or multiple dependent claims not paid on filing or on later presentation must only be paid or these claims cancelled by amendment prior to the expiration of the time period set for response by the PTO in any notice of fee deficiency (37 C.F.R. Section 1.16(d)), it might be best not to authorize the PTO to charge additional claim fees, except possibly when dealing with amendments after final action.*

- ☐ 37 C.F.R. Section 1.16(e) (surcharge for filing the basic filing fee and/or declaration on a date later than the filing date of the application)
- ☐ 37 C.F.R. Section 1.17(a)(1)-(5) (extension fees pursuant to Section 1.136(a).
- ☐ 37 C.F.R. Section 1.17 (application processing fees)

*NOTE: "A written request may be submitted in an application that is an authorization to treat any concurrent or future reply, requiring a petition for an extension of time under this paragraph for its timely submission, as incorporating a petition for extension of time for the appropriate length of time. An authorization to charge all required fees, fees under Section 1.17, or all required extension of time fees will be treated as a constructive petition for an extension of time in any concurrent or future reply requiring a petition for an extension of time under this paragraph for its timely submission. Submission of the fee set forth in Section 1.17(a) will also be treated as a constructive petition for an extension of time in any concurrent reply requiring a petition for an extension of time under this paragraph for its timely submission." 37 C.F.R. Section 1.136(a)(3).*

- ☐ 37 C.F.R. Section 1.18 (issue fee at or before mailing of Notice of Allowance, pursuant to 37 C.F.R. Section 1.311(b))

NOTE: Where an authorization to charge the issue fee to a deposit account has been filed before the mailing of a Notice of Allowance, the issue fee will be automatically charged to the deposit account at the time of mailing the notice of allowance. 37 C.F.R. Section 1.311(b)).

NOTE: 37 C.F.R. Section 1.28(b) requires "Notification of any change in status resulting in loss of entitlement to small entity status must be filed in the application . . . prior to paying, or at the time of paying, . . . issue fee." From the wording of 37 C.F.R. Section 1.28(b), (a) notification of change of status must be made even if the fee is paid as "other than a small entity" and (b) no notification is required if the change is to another small entity.

## 16. Instructions as to Overpayment

NOTE: "... Amounts of twenty-five dollars or less will not be returned unless specifically requested within a reasonable time, nor will the payer be notified of such amounts; amounts over twenty-five dollars may be returned by check or, if requested, by credit to a deposit account." 37 C.F.R. Section 1.26(a).

☒ Credit Account No. 12-0425.

☐ Refund



**SIGNATURE OF PRACTITIONER**

WILLIAM R. EVANS

(type or print name of practitioner)

Reg. No. 25,858

Tel. No.: (212)708-1930

LADAS & PARRY

P.O. Address

Customer No.:

26 WEST 61<sup>ST</sup> STREET  
NEW YORK, N.Y. 10023

☒ **Incorporation by reference of added pages**

*(check the following item if the application in this transmittal claims the benefit of prior U.S. application(s) (including an international application entering the U.S. stage as a continuation, divisional or C-I-P application) and complete and attach the ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION(S) CLAIMED)*

☒ Plus Added Pages for New Application Transmittal Where Benefit of Prior U.S. Application(s) Claimed

Number of pages added 5

☐ Plus Added Pages for Papers Referred to in Item 4 Above

Number of pages added \_\_\_\_\_

☐ Plus added pages deleting names of inventor(s) named on prior application(s) who is/are no longer inventor(s) of the subject matter claimed in this application.

Number of pages added \_\_\_\_\_

☐ Plus "Assignment Cover Letter Accompanying New Application"

Number of pages added \_\_\_\_\_

☐ **Statement Where No Further Pages Added**

*(if no further pages form a part of this Transmittal, then end this Transmittal with this page and check the following item)*

☐ This transmittal ends with this page.

**ADDED PAGES FOR APPLICATION TRANSMITTAL WHERE BENEFIT OF  
PRIOR U.S. APPLICATION(S) CLAIMED**

NOTE: See 37 CFR 1.78.

**17. Relate Back**

**WARNING:** *If an application claims the benefit of the filing date of an earlier filed application under 35 U.S.C. 120, 121 or 365(c), the 20-year term of that application will be based upon the filing date of the earliest U.S. application that the application makes reference to under 35 U.S.C. 120, 121 or 365(c). (35 U.S.C. 154(a)(2) does not take into account, for the determination of the patent term, any application on which priority is claimed under 35 U.S.C. 119, 365(a) or 365(b).) For a c-i-p application, applicant should review whether any claim in the patent that will issue is supported by an earlier application and, if not, the applicant should consider canceling the reference to the earlier filed application. The term of a patent is not based on a claim-by-claim approach. See Notice of April 14, 1995, 60 Fed. Reg. 20,195, at 20,205.*

*(complete the following, if applicable)*

☒ Amend the specification by inserting, before the first line, the following sentence:

**A. 35 U.S.C. 119(e)**

NOTE: *"Any nonprovisional application claiming the benefit of one or more prior filed copending provisional applications must contain or be amended to contain in the first sentence of the specification following the title a reference to each such prior provisional application, identifying it as a provisional application, and including the provisional application number (consisting of series code and serial number)." 37 C.F.R. § 1.78(a)(4).*

☐ "This application claims the benefit of U.S. Provisional Application(s) No(s).:

**APPLICATION NO(S).:**

**FILING DATE**

\_\_\_\_\_/\_\_\_\_\_  
\_\_\_\_\_/\_\_\_\_\_  
\_\_\_\_\_/\_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

and incorporates the same by reference."

**B. 35 U.S.C. 120, 121 and 365(c)**

NOTE: *"Except for a continued prosecution application filed under § 1.53(d), any nonprovisional application claiming the benefit of one or more prior filed copending nonprovisional applications or international applications designating the United States of America must contain or be amended to contain in the first sentence of the specification following the title a reference to each such prior application, identifying it by application number (consisting of the series code and serial number) or international application number and international filing date and indicating the relationship of the applications. . . . Cross-references to other related applications may be made when appropriate." (See § 1.14(a)). 37 C.F.R. § 1.78(a)(2).*

☒ "This application is a

☒ continuation

☐ continuation-in-part

☐ divisional

of copending application(s)

☐ application number \_\_\_\_\_ filed on \_\_\_\_\_,

☐ which is

☒ International Application PCT/AU99/00084 filed on 11 FEBRUARY 1999 and which designated the U.S.,  
claims the benefit thereof and incorporates the same by reference."

NOTE: The proper reference to a prior filed PCT application that entered the U.S. national phase is the U.S. serial number and the filing date of the PCT application that designated the U.S.

NOTE: (1) Where the application being transmitted adds subject matter to the International Application, then the filing can be as a continuation-in-part or (2) if it is desired to do so for other reasons then the filing can be as a continuation.

NOTE: The deadline for entering the national phase in the U.S. for an international application was clarified in the Notice of April 28, 1987 (1079 O.G. 32 to 46) as follows:

"The Patent and Trademark Office considers the International application to be pending until the 22nd month from the priority date if the United States has been designated and no Demand for International Preliminary Examination has been filed prior to the expiration of the 19th month from the priority date and until the 32nd month from the priority date if a Demand for International Preliminary Examination which elected the United States of America has been filed prior to the expiration of the 19th month from the priority date, provided that a copy of the international application has been communicated to the Patent and Trademark Office within the 20 or 30 month period respectively. If a copy of the international application has not been communicated to the Patent and Trademark Office within the 20 or 30 month period respectively, the international application becomes abandoned as to the United States 20 or 30 months from the priority date respectively. These periods have been placed in the rules as paragraph (h) of § 1.494 and paragraph (i) of § 1.495. A continuing application under 35 U.S.C. 365(c) and 120 may be filed anytime during the pendency of the international application."

☐ "The nonprovisional application designated above, namely application \_\_\_\_\_/\_\_\_\_\_, filed \_\_\_\_\_, claims the benefit of U.S. Provisional Application(s) No(s).:

APPLICATION NO(S).:

FILING DATE

\_\_\_\_\_/\_\_\_\_\_  
\_\_\_\_\_/\_\_\_\_\_  
\_\_\_\_\_/\_\_\_\_\_

\_\_\_\_\_"  
\_\_\_\_\_"  
\_\_\_\_\_

☐ Where more than one reference is made above please combine all references into one sentence.

## 18. Relate Back—35 U.S.C. 119 Priority Claim for Prior Application

The prior U.S. application(s), including any prior International Application designating the U.S., identified above in item 17B, in turn itself claim(s) foreign priority(ies) as follows:

<u>AUSTRALIA</u>	<u>PP 1782</u>	<u>11 FEBRUARY 1998</u>
Country	Appln. no.	Filed

The certified copy(ies) has (have)

☒ been filed in prior application PCT/AU99/00084, which was filed on 11 FEBRUARY 1999

☐ is (are) attached.

**WARNING:** *The certified copy of the priority application that may have been communicated to the PTO by the International Bureau may not be relied on without any need to file a certified copy of the priority application in the continuing application. This is so because the certified copy of the priority application communicated by the International Bureau is placed in a folder and is not assigned a U.S. serial number unless the national stage is entered. Such folders are disposed of if the national stage is not entered. Therefore, such certified copies may not be available if needed later in the prosecution of a continuing application. An alternative would be to physically remove the priority documents from the folders and transfer them to the continuing application. The resources required to request transfer, retrieve the folders, make suitable record notations, transfer the certified copies, enter and make a record of such copies in the Continuing Application are substantial. Accordingly, the priority documents in folders of international applications that have not entered the national stage may not be relied on. Notice of April 28, 1987 (1079 O.G. 32 to 46).*

## 19. Maintenance of Copendency of Prior Application

**NOTE:** *The PTO finds it useful if a copy of the petition filed in the prior application extending the term for response is filed with the papers constituting the filing of the continuation application. Notice of November 5, 1985 (1060 O.G. 27).*

A. ☐ Extension of time in prior application

*(This item **must** be completed and the papers filed **in the prior application**, if the period set in the prior application has run.)*

☐ A petition and fee extends the term in the pending **prior** application until \_\_\_\_\_.

☐ A **copy** of the petition filed in prior application is attached.

B. ☐ Conditional Petition for Extension of Time in Prior Application

☐ A conditional petition for extension of time is being filed in the pending **prior** application.

☐ A **copy** of the conditional petition filed in the prior application is attached.

C. ☐ No extension is necessary in Prior Application

☐ Issue Fee paid \_\_\_\_\_

**20. Further Inventorship Statement Where Benefit of Prior Application(s) Claimed**

*(complete applicable item (a), (b) and/or (c) below)*

- (a) ☐ This application discloses and claims only subject matter disclosed in the prior application whose particulars are set out above and the inventor(s) in this application are

☐ the same.

- ☐ less than those named in the prior application. It is requested that the following inventor(s) identified for the prior application be deleted:

---

*(type name(s) of inventor(s) to be deleted)*

- (b) ☐ This application discloses and claims additional disclosure by amendment and a new declaration or oath is being filed. With respect to the prior application, the inventor(s) in this application are

☐ the same.

- ☐ the following additional inventor(s) have been added:

---

*(type name(s) of inventor(s) to be deleted)*

- (c) ☐ The inventorship for all the claims in this application are

☐ the same.

- ☐ not the same. An explanation, including the ownership of the various claims at the time the last claimed invention was made

☐ is submitted.

☐ will be submitted.

**21. Abandonment of Prior Application *(if applicable)***

- ☐ Please abandon the prior application at a time while the prior application is pending, or when the petition for extension of time or to revive in that application is granted, and when this application is granted a filing date, so as to make this application copending with said prior application.

**NOTE:** According to the Notice of May 13, 1983 (103, TMOG 6-7), the filing of a continuation or continuation-in-part application is a proper response with respect to a petition for extension of time or a petition to revive and should include the express abandonment of the prior application conditioned upon the granting of the petition and the granting of a filing date to the continuing application.



## 22. Petition for Suspension of Prosecution for the Time Necessary to File an Amendment

**WARNING:** *"The claims of a new application may be finally rejected in the first Office action in those situations where (1) the new application is a continuing application of, or a substitute for, an earlier application, and (2) all the claims of the new application (a) are drawn to the same invention claimed in the earlier application, and (b) would have been properly finally rejected on the grounds of art of record in the next Office action if they had been entered in the earlier application." MPEP, § 706.07(b).*

**NOTE:** *Where it is possible that the claims on file will give rise to a first action final for this continuation application and for some reason an amendment cannot be filed promptly (e.g., experimental data is being gathered) it may be desirable to file a petition for suspension of prosecution for the time necessary.*

*(check the next item, if applicable)*

☐ There is provided herewith a Petition To Suspend Prosecution for the Time Necessary to File An Amendment (New Application Filed Concurrently)

## 23. Small Entity (37 CFR § 1.28(a))

☐ Applicant has established small entity status by the filing of a statement in parent application \_\_\_\_\_ on \_\_\_\_\_.

☐ A copy of the statement previously filed is included.

**WARNING:** *See 37 CFR § 1.28(a).*

## 24. NOTIFICATION IN PARENT APPLICATION OF THIS FILING

☐ A notification of the filing of this  
*(check one of the following)*

☐ continuation

☐ continuation-in-part

☐ divisional

is being filed in the parent application, from which this application claims priority under 35 U.S.C. § 120.

**PATENT**

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re application: SCOTT WILLIAM KING, et al

For: MICRO WAVE CELLULAR ARCHITECTURE

Attorney Docket No.: U 012912-1

**Assistant Commissioner for Patents  
Washington, D.C. 20231**

Sir:

**PRELIMINARY AMENDMENT**

Please amend the above application as follows:

**IN THE CLAIMS**

Claim 4, line 1, delete "claims 2 to 3" and replace therefor -- claim 2--

Claim 6, line 1, delete "any one of claims 2 to 5" and replace therefor -- claim  
2--

Claim 11, line 1, delete "or 10"

---

**CERTIFICATE UNDER 37 1.10**

I hereby certify that this paper is being deposited with the United States Postal Service on this date AUGUST 21, 2000 in an envelope as "EXPRESS MAIL POST OFFICE/TO ADDRESS-EE" Mailing Label Number EL699731075US addressed to the: Commissioner of Patents and Trademarks, Washington, D.C. 20231

CONNIE YANNOTTI

(Type or print name of person mailing paper)



(Signature of person mailing paper)

**NOTE:** Each paper or fee referred to as enclosed herein has the number of the "EXPRESS MAIL" mailing label place thereon prior to mailing 37 CFR 1.16(b).

**EXPRESS MAIL LABEL  
NO.: EL699731075US**

Claim 13, line 1, delete "or 10"

Claim 15, line 1, delete "any one of claims 7 to 14" and replace therefor

-- claim 7--

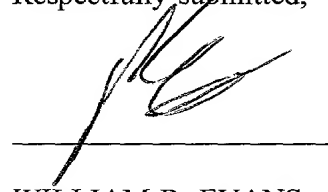
Claim 17, line 1, delete "any one of claims 2 to 16" and replace therefor

-- claim 2--

Claim 20, line 1, delete "any one of the preceding claims" and replace therefor

-- claim 1 --

Respectfully submitted,



WILLIAM R. EVANS  
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- 1 -

## MICRO WAVE CELLULAR ARCHITECTURE

### Technical Field

The present invention relates to Local Multipoint Communication Systems (LMCS), which are also known as Local Multipoint Distribution Systems (LMDS)

### Background Art

LMCS/LMDS networks comprise a plurality of suitably arranged and configured transmitters operating on a frequency assignment basis. Such networks typically operate using QAM, QPSK, or some other digital modulation scheme. The networks are designed to minimise problems of intersymbol interference (ISI) at receiving sites where two or more signals could potentially be received.

There are a number of frequency assignment techniques known to the industry including:

- (1) frequency division, in which an allocated spectrum is divided to form sets of frequencies which are applied to a cell structure in such a fashion that adjacent nearby cells operate on sufficiently different frequencies to avoid ISI;
- (2) signal polarisation, which can effectively create or extend the number of available frequencies; and
- (3) half channel interleaving, which can be used with some modulation schemes to allow a particular frequency to be reused in nearly adjacent cells.

It has been proposed to carry multiple video channels on such systems. In some countries, one or more bands around 26, 27 or 28 GHz have been reserved, whilst in others, the reserved bands are around 38 to 40 GHz. At these frequencies, the propagation of radio waves is relatively directional.

### Disclosure of the Invention

In a first aspect, the invention provides a transmission network for communicating information at directional radio frequencies, said network comprising:

a broadband network servicing a first area, and including a plurality of first and second transmitters, the direction of transmission of each first and second transmitter lying substantially parallel to a first geographical axis, and

a broadcast network servicing a second area substantially overlaying the first area, and including a plurality of third and fourth transmitters, the direction of transmission of each third and fourth transmitter lying substantially parallel to a second geographical axis, the second axis being orthogonal to the first axis.

wherein the broadband network transmits in a first frequency band, and the broadcast network transmits in a second frequency band, the first frequency band being substantially the same as the second frequency band.

In a second aspect, the invention provides a transmission network for communicating information at directional radio frequencies, said network comprising:

(a) a plurality of first, second, third and fourth cells, each first, second, third and fourth cell comprising:

a first transmitter for transmitting radio frequency information in a first direction to define a first reception footprint substantially within the cell, the first transmitter being disposed at or adjacent a periphery of the cell, and

a second transmitter for transmitting radio frequency information in a second direction substantially opposed to the first direction to define a second reception footprint substantially overlapping the first reception footprint, the second transmitter being disposed at or adjacent the periphery of the cell at a position substantially opposed to the first transmitter,

the first, second, third and fourth cells being generally circular or oval in plan, of similar size and transmitting at first, second, third and fourth frequencies respectively, the first transmitter of each first cell being disposed at or adjacent the second transmitter of an adjacent second cell, and the first transmitter of each third cell being disposed adjacent the second transmitter of an adjacent fourth cell.

the plurality of cells being arranged such that the first and second directions, in which the first and second transmitters respectively transmit, are parallel;

(b) a first rectangular array of the first and second cells, the periphery of each first and second cell abutting the peripheries of respective surrounding first and second cells, wherein rows of the first rectangular array in a direction parallel to the first and second directions comprise alternating first and second cells, and each of the rows of the first rectangular array orthogonal to the first and second directions includes either first or second cells, and

(c) a second rectangular array of the third and fourth cells, the periphery of each third and fourth cell abutting the peripheries of respective surrounding third and fourth cells, wherein rows of the second rectangular array in a direction parallel to the first and second directions comprise alternating third and fourth cells, and each of the rows of the second rectangular array orthogonal to the first and second directions includes either third or fourth cells,

wherein the cells of the second rectangular array are displaced with respect to the cells of the first rectangular array by approximately the radius of a cell in the first direction, and by approximately the radius of a cell in a direction orthogonal to the first direction.

5        In the present specification, references to "frequencies" and "different frequencies" are intended to include signals having different frequencies but the same polarisation, and signals having the same frequency but different relative polarisations. These references are also intended to cover bands of frequencies, as well as single frequencies.

10       Further, references to a transmission or broadcast "direction" or the like are intended to refer to a general orientation of the transmitter involved. As will be apparent to those skilled in the art, transmission in a given direction is intended to include transmission of a footprint in that direction onto the ground.

15       **Brief Description of Drawings**

Various preferred forms of the invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1(a) is a schematic view of a cell according to a first aspect of the invention;

Figure 1(b) is a schematic view of a cell for use with a network according to a second aspect of the invention;

5 Figure 2 is a schematic view of a plurality of cells forming a broadband network according to the second aspect of the invention.

Figure 3 is a schematic view of the network shown in Figure 2, illustrating transmitter positions and frequency allocation for each cell;

10 Figure 4 is a schematic view of the network of figure 3 with an overlapping orthogonal broadcast network;

Figure 5 is a simplified graph showing exemplary spectrum allocations for the network shown in figure 4;

Figure 6(a) is a schematic view showing interconnection of a plurality of cells to form a cluster;

15 Figure 6(b) is a schematic view showing tessellation of multiple clusters such as those shown in 6(a) to form a network of clusters;

Figure 7 is a schematic view showing a broadcast network overlaying the broadband network of Figure 3, the broadcast network using FM modulation;

20 Figure 8 is a schematic view of broadband network such as that shown in Figure 2, in which frequency assignment of the spectrum shown in Figure 5 is made;

Figures 9 and 10 are schematic views showing interference of the broadband outbound and broadcast network respectively;

Figure 11(a) is a schematic view of the network shown in Figure 3, showing distribution and polarisation of spectrum allocation 'B' as shown in Figure 5;

25 Figure 11(b) is a detailed view of portions of networks shown in Figure 11(a), illustrating the return path for broadband services;

Figure 12(a) is a schematic view of a plurality of cells arranged to form a first rectangular array; and

30 Figure 12(b) is a schematic view of a plurality of cells arranged to form a second rectangular array configured for use with the first rectangular array shown in Figure 12(a).

#### Detailed Description of Preferred Embodiments

Referring to the drawings, and Figure 1(a) in particular, there is provided a cell 1 for use in a transmission network for communicating information at directional radio frequencies. The cell 1 includes a first transmitter 2 for transmitting radio frequency information in a first direction 4 to define a first reception footprint 6 which substantially covers cell 1. The first transmitter 2 is disposed at a periphery 8 of the cell 1. The cell 1 also includes a second transmitter 10 for transmitting radio frequency information in a

second direction 12 substantially opposed to the first direction 4, to define a second reception footprint 13 which also effectively covers the cell 1. The second transmitter 10 is also disposed at the periphery 8 of the cell 1, at a position substantially opposed to the first transmitter 2. In the preferred embodiment the reception footprint 13 defined by the second transmitter 10 substantially overlaps the reception footprint 6 defined by the first transmitter 2.

The cell 1 is generally circular in plan, and represents a coverage yielded by a 64 degree horn having a 28 dB front to back ratio and 17 dB sidelobe at 90 degrees. Whilst other cell shapes may be utilised, the circular cell shown is preferred due to the way in which a plurality of such cells may be arranged in a substantially regular array or matrix to form an improved transmission network. It will also be appreciated that the horn parameters given are exemplary only, and that others values could be substituted depending upon the particular implementation of the invention. Turning to Figures 2 to 11(b), there is provided a transmission network 14 including a plurality of the cells 1. the cells 1 being arranged such that the first direction 4 and the second direction 12 are parallel.

In a preferred form of the invention shown in Figure 3, the transmission network 14 includes a plurality of first, second, third and fourth cells 16, 18, 20 and 22. Each of the first, second, third and fourth cells 16, 18, 20 and 22 are generally circular in plan, are of similar size, and transmit at first, second, third and fourth frequencies respectively.

The first transmitter of each first cell 16 is disposed at or adjacent the second transmitter of an adjacent second cell 18 and a first transmitter of each third cell 20 is adjacent the second transmitter of an adjacent fourth cell 22. In this way there is defined a parallel "back to back" edge transmission network.

As best shown in the embodiment of the invention in Figures 12(a) and (b), the transmission network includes a first rectangular array 17 of the first and second cells 16 and 18, a periphery of each first and second cell abutting the peripheries of respective surrounding first and second cells. Rows 19 of the first rectangular array 17 in a direction parallel to the first and second directions comprise alternating first and second cells, whilst each of the rows 21 of the first rectangular array 16 orthogonal to the first and second directions consists of either first or second cells.

The transmission network also includes a second rectangular array 23 of the third and fourth cells 20 and 22, the periphery of each third and fourth cell abutting the peripheries of respective surrounding third and fourth cells. Rows 24 of the second rectangular array 23 in a direction parallel to the first and second directions comprise alternating third and fourth cells, and each of the rows 26 of the second rectangular array orthogonal to the first and second directions consist of either third or fourth cells. The cells of the second rectangular array 23 are displaced with respect to the cells of the first



rectangular array 16 by approximately the radius of a cell in the first direction, and by approximately the radius of a cell in a direction orthogonal to the first direction.

In a preferred form, the first, second, third and fourth frequencies used by the first, second third and fourth cells respectively are generated from a pair of frequencies or frequency bands. By applying horizontal and vertical polarisation to each of the two frequencies, effectively a full frequency set is generated. This method is only useful at frequencies sufficiently high that polarisation remains generally stable throughout a transmission area. Relatively low frequency transmissions do not allow for stable polarisation.

In a preferred embodiment, the transmission network forms part of a broadband two way network, in which return signals are transmitted from one or more return sites within each cell. To avoid interference, the return signals are transmitted at one or more frequencies other than the first, second, third or fourth frequencies. Depending upon the position of a return site within a cell, it may transmit its return signal towards either the first or second transmitter. A suitable receiver is located adjacent each transmitter to receive returned signals, thereby enabling a true broadband service.

Referring to Figures 4 and 7 to 10, in a preferred form, the transmission network 14 (shown in dotted lines) further includes an overlaid broadcasting network (solid lines) for one-way broadcast of information. Typically, this information will be multiple video channels or the like, but can also include radio or any other transmitted media. As best shown in Figure 4, the broadcasting network includes a plurality of fifth cells 30 and sixth cells 32.

Each fifth cell 30 includes a fifth transmitter 34 for transmitting radio frequency information in a third direction 36 orthogonal to the first and second directions onto a reception footprint 35 substantially within the fifth cell. Each fifth transmitter 34 is disposed at a periphery of the corresponding fifth cell 30. Figure 1(b) shows the general arrangement of the fifth and sixth cells 30 and 32.

Each sixth cell 32 includes a sixth transmitter 38 for transmitting radio frequency information in a fourth direction 40 substantially opposite the third direction 36 to define a reception footprint 42 substantially within the sixth cell 32. Each sixth transmitter 38 is disposed at the periphery of the corresponding sixth cell 32.

In the broadcasting network, the fifth transmitter 34 of each fifth cell 30 is disposed adjacent the sixth transmitter 38 of an adjacent sixth cell 32. Furthermore, there is provided a third rectangular array of the fifth and sixth cells 30 and 32, similar to the arrays shown in the Figures 12 (a) and 12 (b). The peripheries of each fifth cell 30 and sixth cell 32 abut the peripheries of respective surrounding fifth and sixth cells. Rows of the third rectangular array in a direction parallel to the third and fourth directions and comprise alternating fifth and sixth cells 30 and 32. Conversely, each

row of the third rectangular array parallel to the first and second directions consists of only fifth cells 30 or sixth cells 32.

There is also provided a fourth rectangular array of the fifth and sixth cells 30 and 32, once again, in a similar fashion to that shown in Figures 12 (a) and 12 (b). The periphery of each fifth and sixth cell 30 and 32 abuts the peripheries of respective surrounding fifth and sixth cells. Rows of the fourth rectangular array in a direction parallel to the third and fourth directions comprise alternating fifth and sixth cells 30 and 32. Conversely, each row of the fourth rectangular array parallel to the first and second directions includes only fifth cells 30 or sixth cells 32.

The cells of the fourth rectangular array are displaced with respect to the cells of the third rectangular array by approximately the radius of a cell in the third direction and by approximately the radius of a cell in the first direction.

When the broadcasting network is deployed in conjunction with the transmission network, the cells of the third rectangular array are displaced with respect to the cells of the first rectangular array by approximately the radius of a cell in a first direction. Since the first and second directions are orthogonal to the third and fourth directions, the networks can simultaneously utilise frequencies from similar bands, as discussed in more detail below.

A basic requirement of any transmission network is that a sufficient carrier-to-interference (C/I) ratio is maintained. The necessary C/I ratio varies, depending mainly upon the modulation scheme used. In the case of a digital modulation scheme such as, for example, Quadrature Phase Shift Keying (QPSK), a C/I ratio must exceed about 12 dB. In an urban setting and at the frequencies of interest, this ratio translates to a distance ratio of four for like to like transmissions. Different digital modulation schemes may require correspondingly different C/I ratios.

For an FM modulated network, half channel interleaving can be used to create additional members in a frequency set. However, channel interleaving alone does not provide a sufficiently high C/I ratio. For this reason, a distance ratio of greater than three must be maintained between transmission sittings. In an FM network, like to like signals would require a distance ratio of the order of 15 times. Given relatively flat urban terrain and a restriction on transmission heights of about 20 metres, buildings, terrain and foliage provide sufficient isolation due to blockage of the undesired signal. If this is not the case and a site does not have an alternative path available then micro-cell in-filling can be employed to provide a signal of suitable C/I ratio.

As discussed above, to overlay the broadcast and broadband networks, an offset approach is used which makes the transmission of the two networks orthogonal. The cell overlap "petal" patterns of the two networks are also orthogonal. As best shown in Figure 9, signals from a given site in the broadcast network which pass through adjacent or nearly adjacent sites in the broadband outbound network are either tangential to that

network, or the distance ratio exceeds that required for, in this case, QPSK modulation. In some cases, an alternative path exists to the other site servicing the broadband services with a given cell.

5 A similar examination of broadband outbound transmissions on the Broadcast service shows that an alternative path exists in the majority of circumstances where interference might otherwise exist (see Figure 10). Where no alternative path is available, perhaps due to terrain or urban structures, micro-cell in-fills may be used to provide a suitable signal.

10 A return signal for the broadband service can potentially originate from any point within a cell, requiring that the receive antenna at the corresponding transmission site be omnidirectional. This means that directionality cannot be relied upon to increase the C/I ratio in relation to other signals being broadcast through the network. A practical solution to this problem has been to allocate an exclusive spectrum for the return path. The design of the return path network is therefore independent of both the  
15 broadcast network and the broadband outbound network, and can only interfere with itself if it reuses its allocated frequencies in the reserved spectrum. In any case, frequencies used for return paths can not simultaneously be used to provide another return path to the same transmission site. This being the case the network as outlined in Figure 11(a) & 11(b) is presented. Given the symmetry of the network it can be derived  
20 that the return network within each cell services an area of:

$$A = d^2/4 \quad (\text{where } d = \text{the diameter of the cell})$$

Given:

25 HH = 1,500  
P = 50%  
S = 2 (one telephone and one internet service)  
d = 2 km

where:

30 HH = household density per square kilometre  
P = penetration or uptake rate for services  
S = average number of 64Kbit services provided  
QPSK modulation yields 2 Mbit (E1) data channel per 2 MHz of spectrum  
30 x 64Kbit services per E1 channel

35 then the bandwidth required for the broadband return path is:  $B = 100 \text{ MHz}$

Given a spectrum allocation of 1 GHz, the following allocation is possible:

A band: 850 MHz

B band: 100 MHz

Reserved for future use: 50MHz

Therefore a 42 channel FM NTSC or 25 channel FM PAL broadcast service could  
5 be supported. As the broadband service requires only 100 MHz then 650 MHz of the A  
band could be used for return links (polarisation is also possible) to form clusters of cells  
with the central node of the cluster interconnecting with a Broadband backbone (refer to  
Figure 6).

Other configurations are possible. Assuming the broadcast service is digital, or  
10 fewer analog channels are required, and each transmission point in the broadband service is  
interconnected to the Broadband backbone then it is plausible that the broadband data rate  
available per square kilometre may be derived from:

$$d^2 = 1,333 \text{ Mbit} \quad (\text{for QPSK, where } d \text{ is diameter of cell})$$

15 Therefore for  $d=2$  km, a 333 Mbit data rate is available.

The frequency sets in the preferred form of the invention are derived from the  
allocated spectrum on the following basis:

Broadcast Service:

- 20  $A_V$  A band with Vertical Polarisation
- $A_H$  A band with Horizontal Polarisation
- $A_{VI}$  A band with Vertical Polarisation and Half Channel Interleave
- $A_{HI}$  A band with Horizontal Polarisation and Half Channel Interleave

Broadband Service Outbound Transmission:

- 25  $A_{LV}$  Lower half of the A band with Vertical Polarisation
- $A_{LH}$  Lower half of the A Band with Horizontal Polarisation
- $A_{UV}$  Upper half of the A Band with Vertical Polarisation
- $A_{UH}$  Upper half of the A Band with Horizontal Polarisation

30 Broadband Service Return Path Transmission:

- $B_{LV}$  Lower portion of the B band with Vertical Polarisation
- $B_{MV}$  Middle portion of the B band with Vertical Polarisation
- $B_{UV}$  Upper portion of the B band with Vertical Polarisation
- 35  $B_{LH}$  Lower portion of the B band with Horizontal Polarisation
- $B_{MH}$  Middle portion of the B band with Horizontal Polarisation
- $B_{UH}$  Upper portion of the B band with Horizontal Polarisation

This allocation is shown in Figure 5.

As shown in Figure 6, cells may also be clustered to form a node interconnection point, assuming the to/from relay links are also QPSK modulated. Of note is the offsetting of the clusters in order to ensure the concentrated links from/to the node do not align with an adjacent cluster as the distance ratio would not provide sufficient carrier to interference (C/I) isolation.

Turning to Figures 11(a) and 11(b), there is shown a return path arrangement for the broadband network. The segments use frequencies selected from the B spectrum shown in Figure 5, along with vertical and horizontal polarisation in accordance with Figure 11(a). In this way, the network arrangement shown in figure 11(a) makes relatively good use of the allocated spectrum. Typically, the receivers used for the return path of the broadband network use the same directional horns as the transmitters.

It will be appreciated that the present invention includes within its scope all suitable digital and analog modulation schemes. Similarly, the actual frequencies at which the invention may be applied may vary depending upon terrain and other variables. Whilst these frequencies will typically lie in the range of 10 GHz to 50 GHz, the invention may be implemented with frequencies outside of this range, so long as the signals are sufficiently directional.

Although the invention has been described with reference to a number of particular embodiments, it will be appreciated by those skilled in the art that the invention may be embodied in many other forms.

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## CLAIMS:

1. A transmission network for communicating information at directional radio frequencies, said network comprising:

5 a broadband network servicing a first area, and including a plurality of first and second transmitters, the direction of transmission of each first and second transmitter lying substantially parallel to a first geographical axis, and

a broadcast network servicing a second area substantially overlaying the first area, and including a plurality of third and fourth transmitters, the direction of  
10 transmission of each third and fourth transmitter lying substantially parallel to a second geographical axis, the second axis being orthogonal to the first axis,

wherein the broadband network transmits in a first frequency band, and the broadcast network transmits in a second frequency band, the first frequency band being substantially the same as the second frequency band.

15

2. A transmission network for communicating information at directional radio frequencies, said network comprising:

(a) a plurality of first, second, third and fourth cells, each first, second, third and fourth cell comprising:

20 a first transmitter for transmitting radio frequency information in a first direction to define a first reception footprint substantially within the cell, the first transmitter being disposed at or adjacent a periphery of the cell, and

a second transmitter for transmitting radio frequency information in a second direction substantially opposed to the first direction to define a second reception  
25 footprint substantially overlapping the first reception footprint, the second transmitter being disposed at or adjacent the periphery of the cell at a position substantially opposed to the first transmitter,

the first, second, third and fourth cells being generally circular or oval in plan, of similar size and transmitting at first, second, third and fourth frequencies  
30 respectively, the first transmitter of each first cell being disposed at or adjacent the second transmitter of an adjacent second cell, and the first transmitter of each third cell being disposed adjacent the second transmitter of an adjacent fourth cell,

the plurality of cells being arranged such that the first and second directions, in which the first and second transmitters respectively transmit, are parallel;

5 (b) a first rectangular array of the first and second cells, the periphery of each first and second cell abutting the peripheries of respective surrounding first and second cells, wherein rows of the first rectangular array in a direction parallel to the first and second directions comprise alternating first and second cells, and each of the rows of the first rectangular array orthogonal to the first and second directions includes either first or second cells, and

10 (c) a second rectangular array of the third and fourth cells, the periphery of each third and fourth cell abutting the peripheries of respective surrounding third and fourth cells, wherein rows of the second rectangular array in a direction parallel to the first and second directions comprise alternating third and fourth cells, and each of the rows of the second rectangular array orthogonal to the first and second directions includes either third or fourth cells,

15 wherein the cells of the second rectangular array are displaced with respect to the cells of the first rectangular array by approximately the radius of a cell in the first direction, and by approximately the radius of a cell in a direction orthogonal to the first direction.

20 3. A transmission network according to claim 2, wherein the first, second, third and fourth frequencies are generated by horizontal and vertical polarisation of a first frequency and a second frequency.

25 4. A transmission network according to claims 2 to 3, wherein the network is a broadband, two way network, in which return signals are transmitted from one or more points within the cell.

5 5. A transmission network according to claim 4, wherein the return signals are transmitted at a frequency other than the first, second, third or fourth frequencies.

30 6. A transmission network according to any one of claims 2 to 5, further including a broadcasting network for one-way broadcasting of information.

7. A transmission network according to claim 6, wherein the broadcasting network includes a plurality of fifth cells and sixth cells, wherein:

each fifth cell includes a fifth transmitter for transmitting radio frequency information in a third direction orthogonal to the first and second directions to define a reception footprint substantially within the fifth cell, the fifth transmitter being disposed at or adjacent a periphery of the fifth cell; and

each sixth cell includes a sixth transmitter for transmitting radio frequency information in a fourth direction substantially opposite the third direction to define a reception footprint substantially within the sixth cell, the sixth transmitter being disposed at or adjacent a periphery of the sixth cell.

8. A transmission network according to claim 7, wherein the fifth transmitter of each fifth cell is disposed at or adjacent the sixth transmitter of an adjacent sixth cell.

9. A transmission network according to claim 8, including:

a third rectangular array of the fifth and sixth cells, the periphery of each fifth and sixth cell abutting the peripheries of respective surrounding fifth and sixth cells, wherein rows of the third rectangular array in a direction parallel to the third and fourth directions comprise alternating fifth and sixth cells, and each row of the fourth rectangular array parallel to the first and second directions includes either fifth or sixth cells;

a fourth rectangular array of the fifth and sixth cells, the periphery of each fifth and sixth cell abutting the peripheries of respective surrounding fifth and sixth cells, wherein rows of the fourth rectangular array in a direction parallel to the third and fourth directions comprise alternating fifth and sixth cells, and each row of the fifth rectangular array parallel to the first and second directions includes either fifth or sixth cells;

wherein the cells of the fourth rectangular array are displaced with respect to the cells of the third rectangular array by approximately the radius of a cell in the third direction, and by approximately the radius of a cell in the first direction.

10. A transmission network according to claim 9, wherein the cells of the third rectangular array are displaced with respect to the cells of the first rectangular array by approximately the radius of a cell in the first direction.



- 11 A transmission network according to claim 9 or 10, wherein the broadcasting network is an analog network utilising frequency modulation.
- 5 12. A transmission network according to claim 11, wherein cells within the third rectangular array are half channel interleaved with cells from the fourth rectangular array
13. A transmission network according to claim 9 or 10, wherein the broadcasting network utilises a digital modulation scheme.
- 10 14. A transmission network according to claim 13, wherein the digital modulation scheme is quadrature phase shift keyed modulation.
- 15 15. A transmission network according to any one of claims 7 to 14, wherein the information to be broadcast via the broadcasting network is relayed between cells thereof by means of directional receivers and transmitters.
16. A transmission network according to claim 15, wherein the information to be broadcast is relayed at frequencies similar to those used by the broadcasting network.
- 20 17. A transmission network according to any one of claims 2 to 16, wherein the first, second, third and fourth cells are grouped into clusters, each cluster being connected to a broadband backbone through a single connection point.
- 25 18. A transmission network according to claim 17, wherein the cells within each cluster relay information to and from the connection point by means of directional radio frequency transmissions between adjacent cells within the cluster.
- 30 19. A transmission network according to claim 18, wherein the directional radio frequency transmissions are relayed at frequencies similar to those used by the broadcasting network.

20. A transmission network according to any one of the preceding claims, further including infill cells for covering particular areas within the transmission network not covered by any of the first, second, third or fourth cells, or by the broadcasting network.

5 21. A transmission network as claimed in claim 1, wherein the broadcast network is used for one-way broadcasting of information.

22. A transmission network as claimed in claim 1, wherein the broadband network is a two-way network.

10

23. A transmission network as claimed in claim 1, wherein the first and second transmitters are grouped into clusters, each cluster being connected to a broadband backbone through a single connection point.

15

24. A transmission network as claimed in claim 1, wherein the first and second transmitters transmit at any one of a first, second, third or fourth frequency, the first, second, third and fourth frequencies being generated by horizontal and vertical polarisation of a first frequency and a second frequency.

ABSTRACT

A cell (1), and a transmission network formed from a plurality thereof, for communicating information at directional radio frequencies. the cell includes a first transmitter (2) for transmitting radio frequency information in a first direction (4) to define a first reception footprint (6) substantially within the cell (1).  
5 The cell (1) also includes a second transmitter (10) for transmitting radio frequency information in a second direction (12) substantially opposed to the first direction to define a second reception footprint (13) substantially overlapping the first reception footprint (6). The first and second transmitters are disposed at or adjacent a  
10 periphery (8) of the cell (1) at positions substantially opposed to each other.

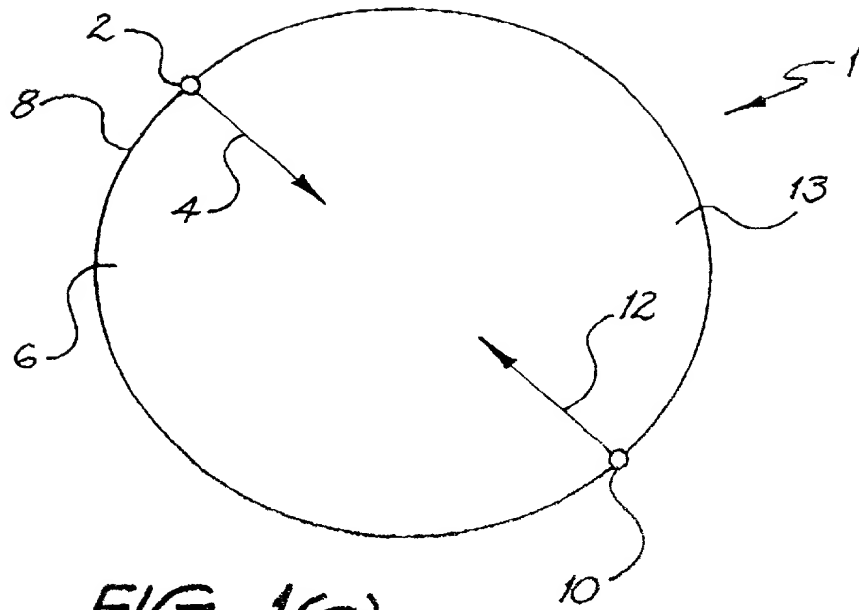


FIG. 1(a)

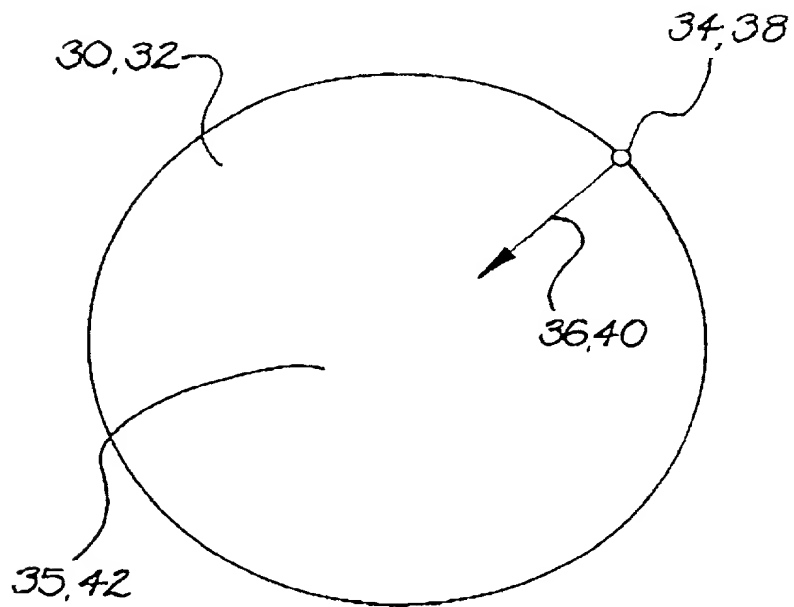
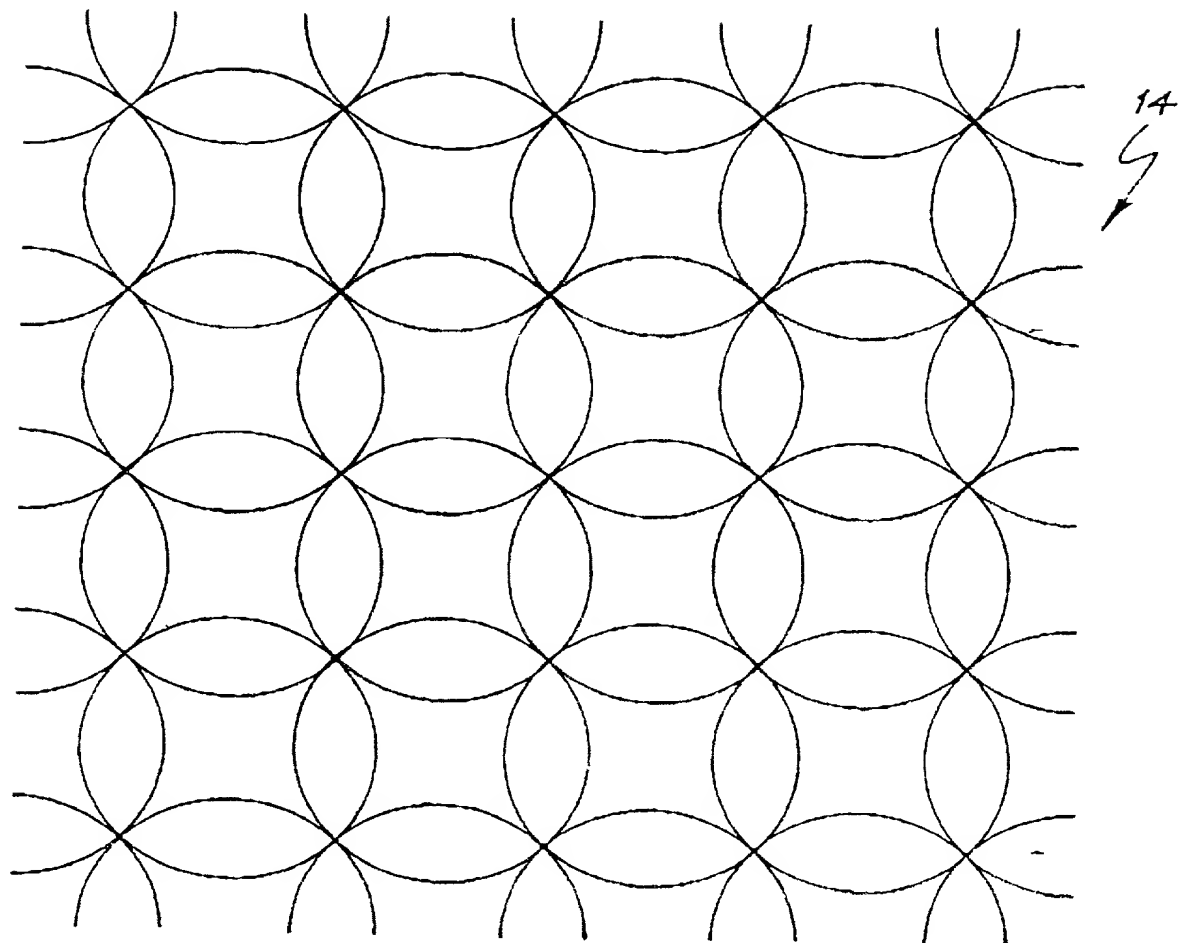
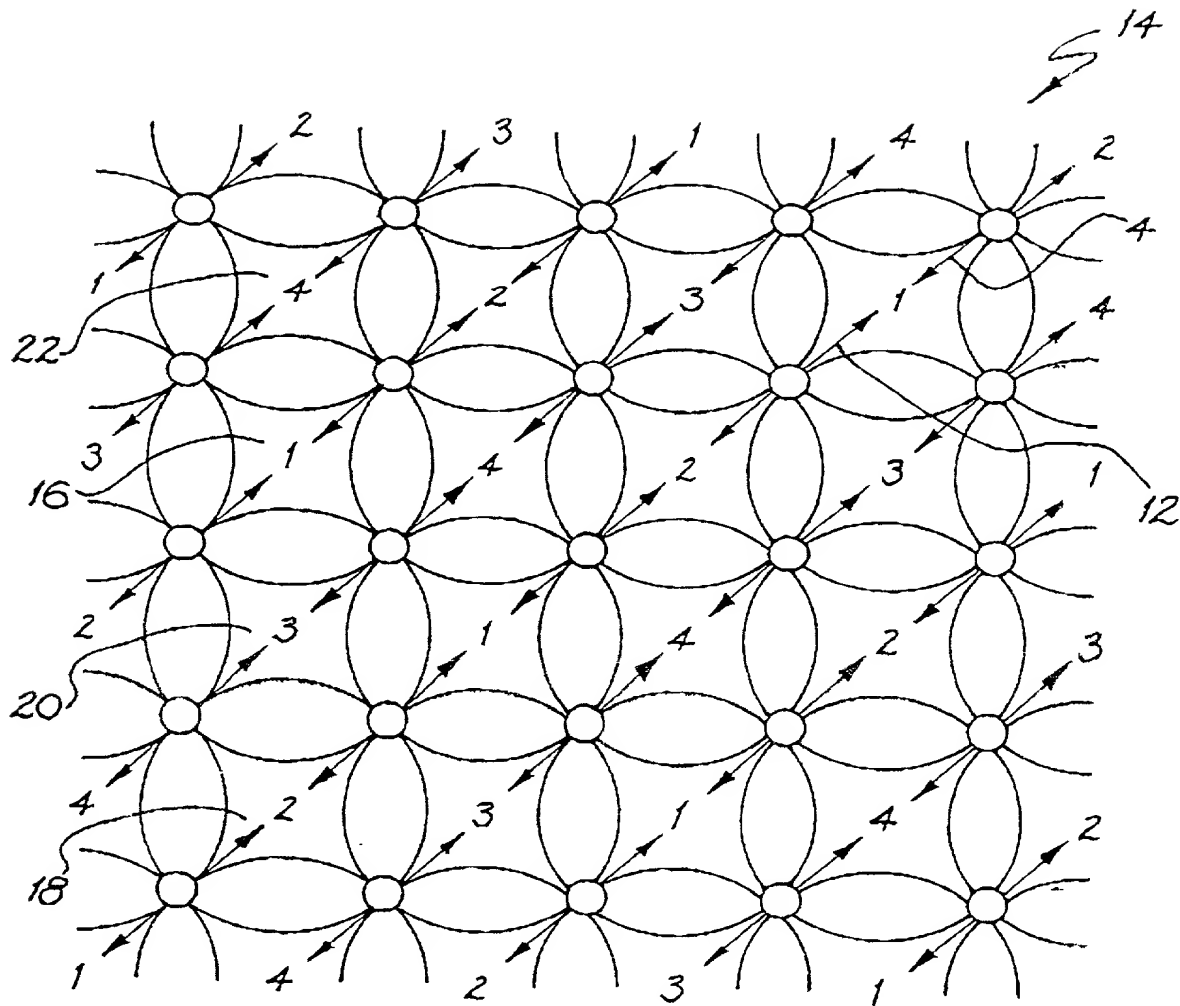


FIG. 1(b)



*ARRAY OF CELLS FORMING A COVERAGE FOOTPRINT*

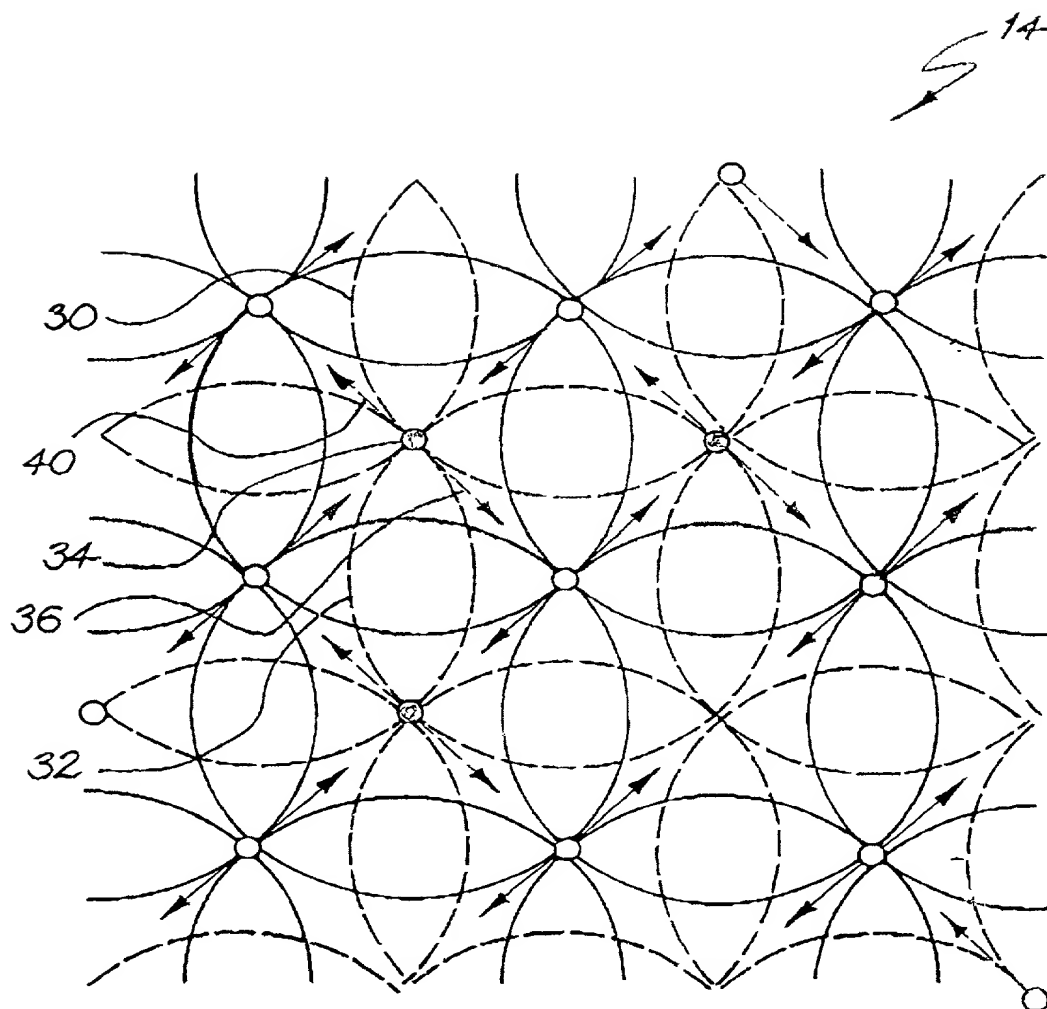
*FIG. 2*



BACK TO BACK EDGE FED OVERLAID FOR DUAL  
COVERAGE

CELLS SERVICED TWICE WITH SAME FREQUENCY.  
FREQUENCY SET (1,2,3,4)

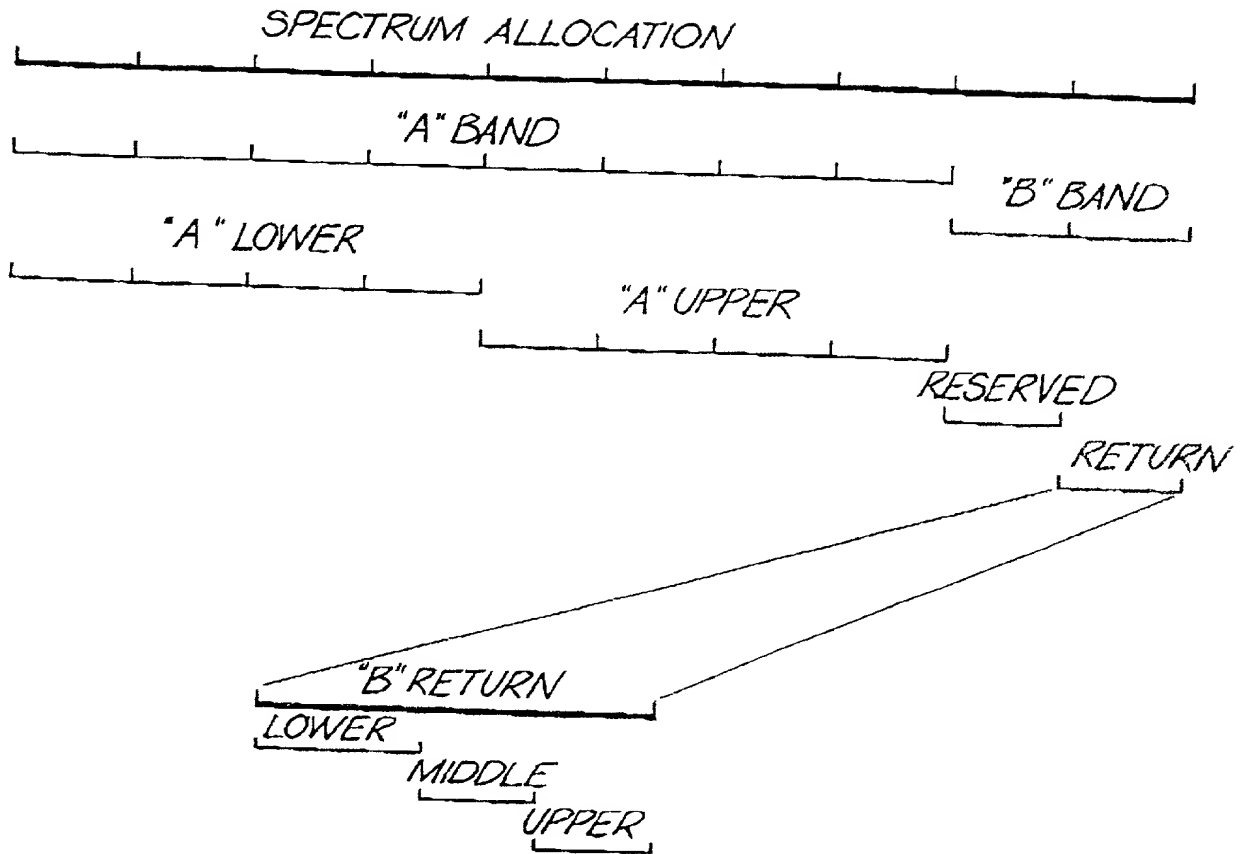
FIG. 3



ORTHOGONAL NETWORKS (BROADCAST & BROADBAND OVERLAY)



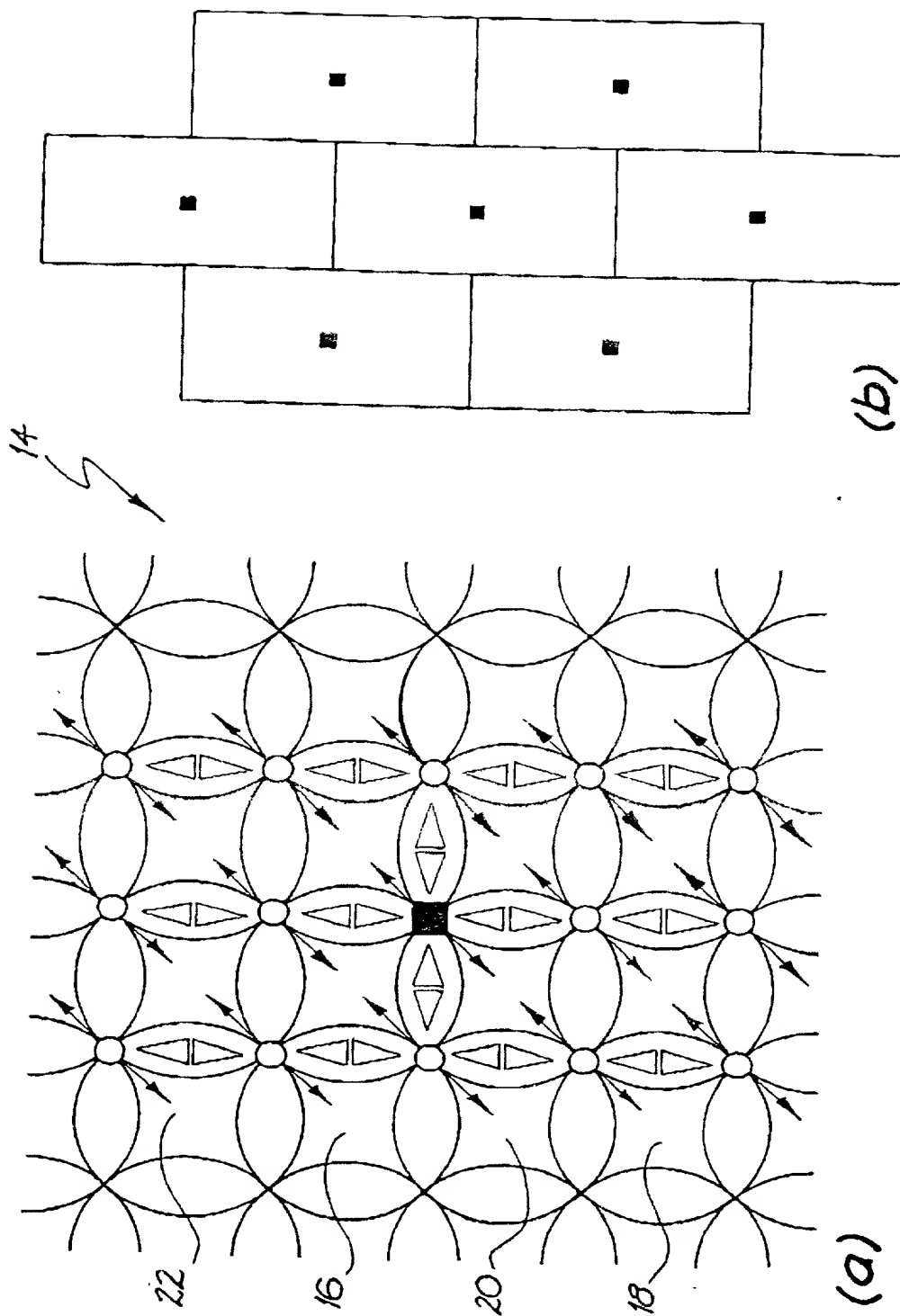
FIG. 4



TYPICAL SPECTRUM ALLOCATION

FIG. 5

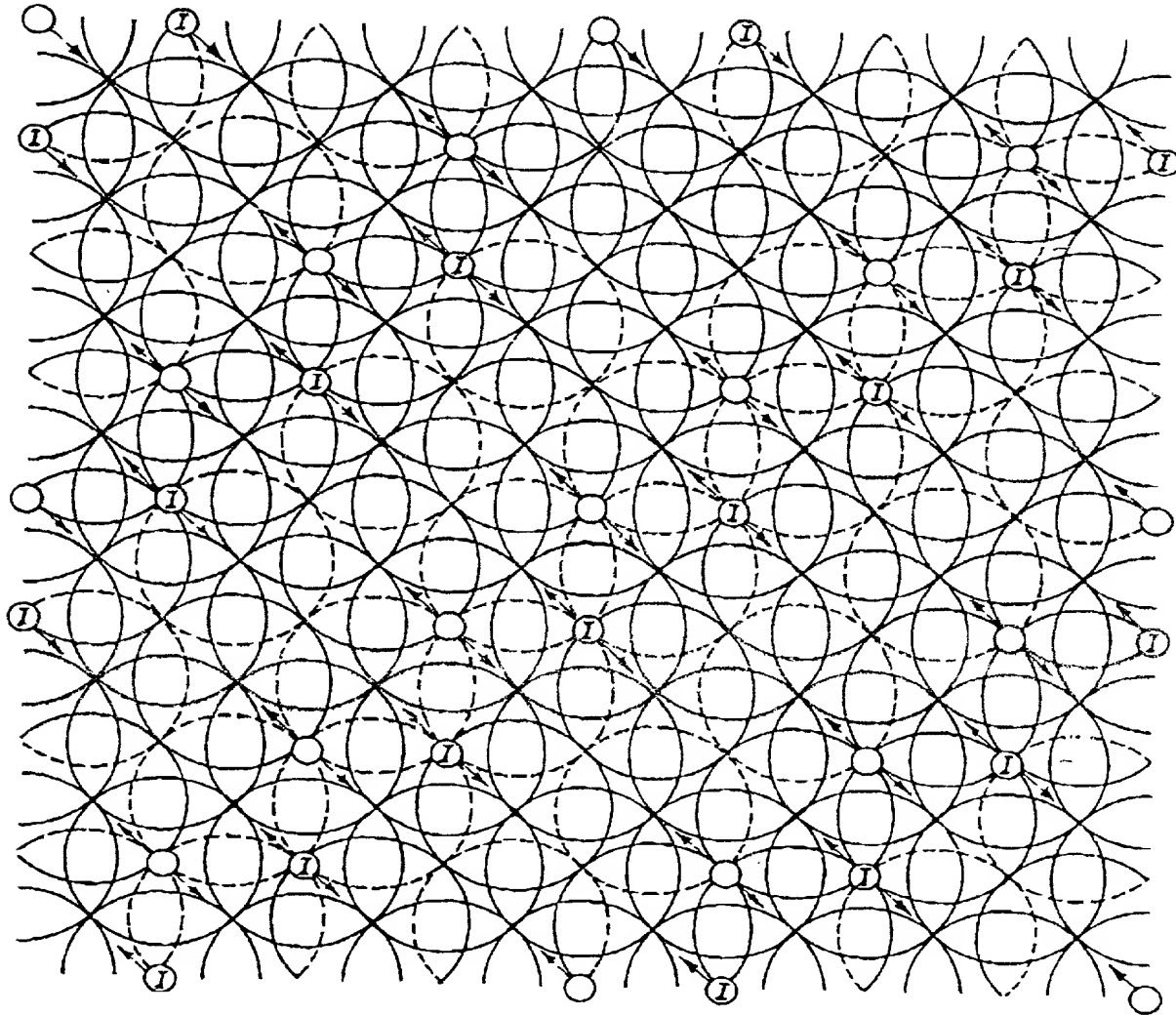




INTERCONNECTION OF CELLS (CLUSTER OF 15)

◊ INTERCONNECTION LINKAGE    ■ NODE

FIG. 6



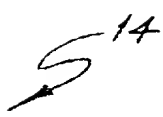
BROADCAST NETWORK (FM MODULATION)

○ VERTICAL  
POLARISATION

○ HORIZONTAL  
POLARISATION

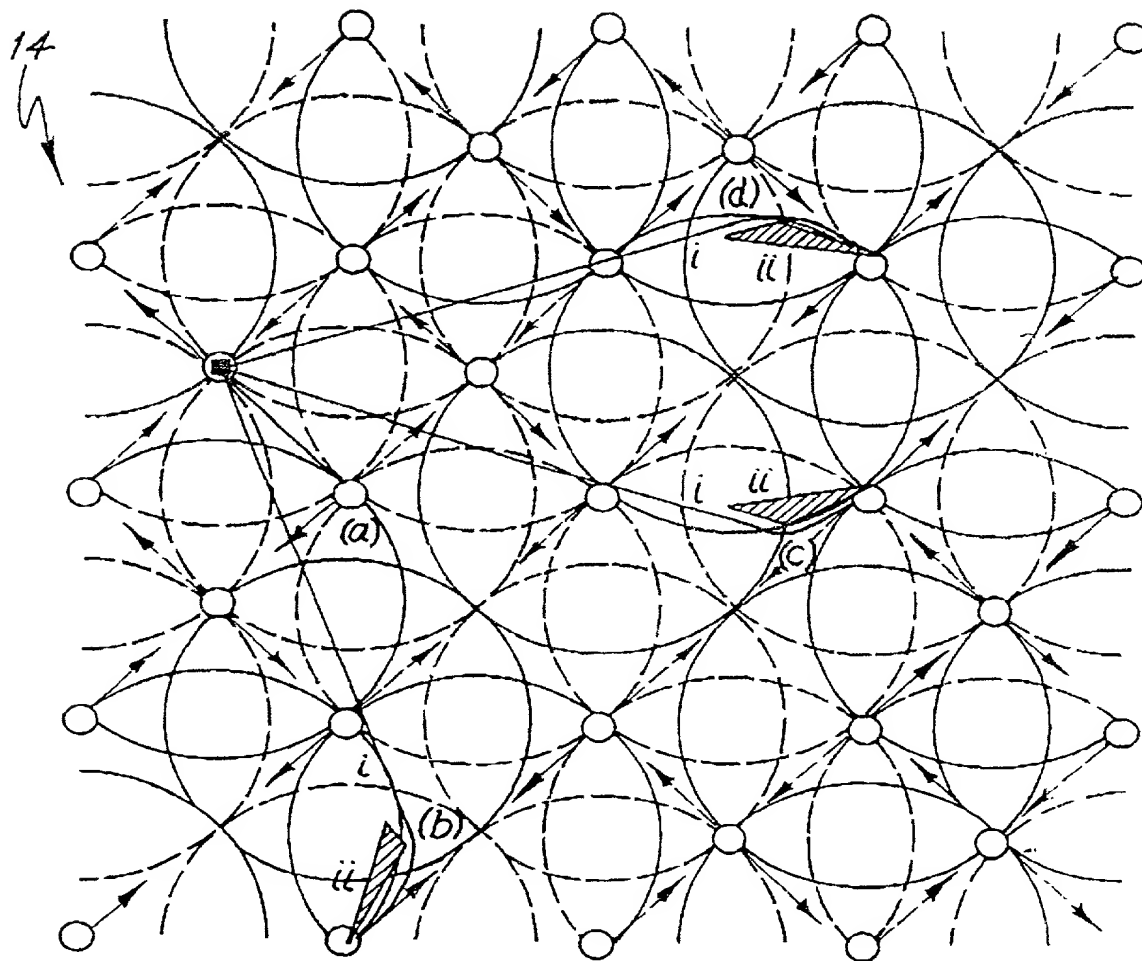
① INDICATES HALF CHANNEL  
INTERLEAVED TRANSMISSIONS

FIG. 7



☒  $X_r$  X POLARISATION      Y 'A' BAND SEGMENT

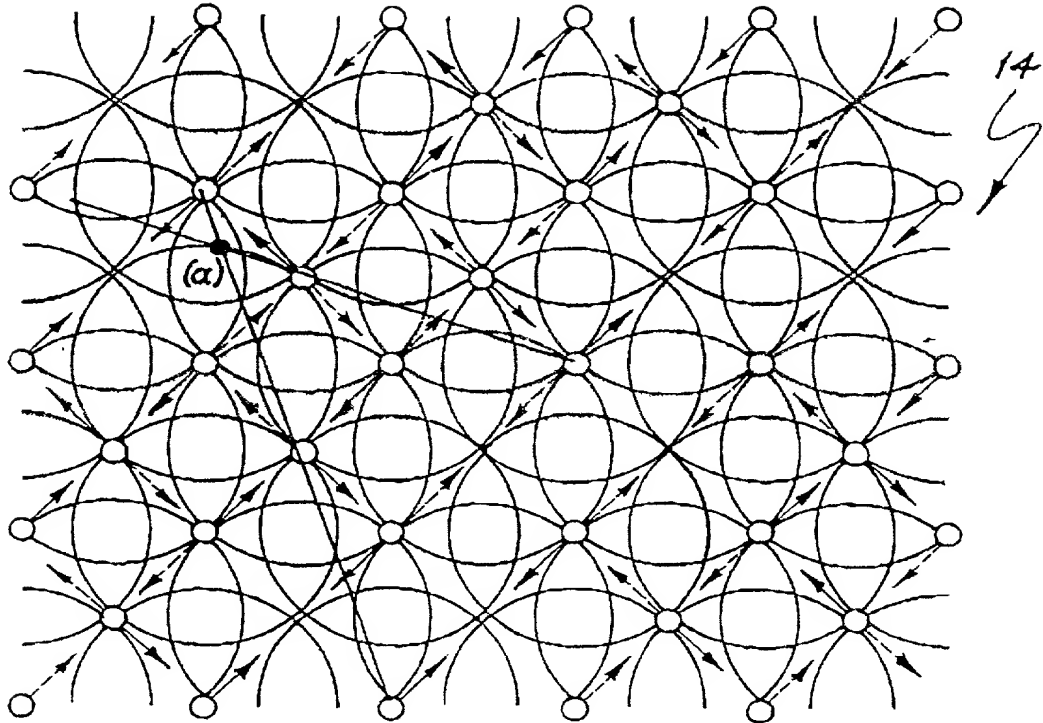
FIG. 8



- (a) TANGENTIAL  
 (b) (c) (d) i. DISTANCE RATIO  
 ii. ALTERNATIVE PATH

BROADCAST INTERFERENCE ON BROADBAND  
 OUTBOUND

FIG. 9

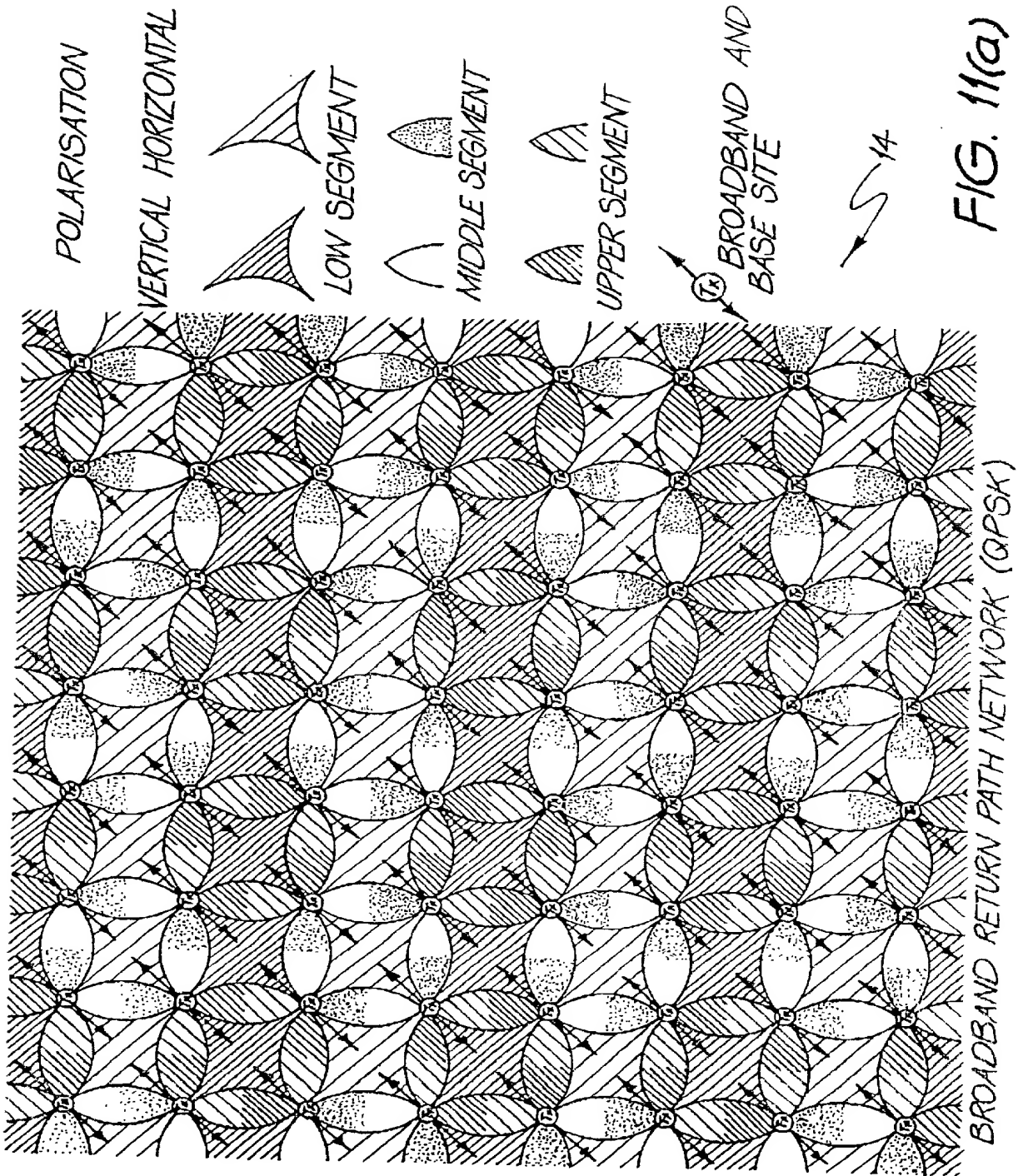


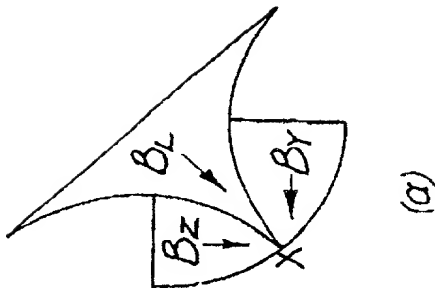
(α) AT POINT (α) THE ALTERNATIVE PATH MAY ALSO BE UNAVAILABLE. IN SUCH AREAS MICRO-CELLS INFILLS COULD BE USED TO PROVIDE ACCESS TO SERVICES.

AT OTHER POINTS ALONG THE LINE OF INTERFERENCE THE ALTERNATIVE PATH MAY BE AVAILABLE IF REQUIRED.

BROADBAND OUTBOUND INTERFERENCE UPON BROADCAST.

FIG. 10





(a)

X BROADBAND BASE SITE

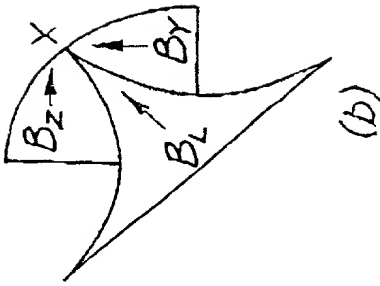
$B_Y$ ,  $B_Z$  APPROPRIATE MEMBER OF  $B_M, B_u$  SET

$B_L$ ,  $B_M, B_u$  SEGMENT OF 'B' BAND

→ RETURN PATH DIRECTION INDICATOR

NOTE:

FOR A GIVEN BROADBAND BASE SITE ONLY ONE USE OF THE VERTICAL AND HORIZONTAL SET MEMBERS OF THE 'B' BAND MAY BE INCOMING. HENCE ALLOCATION FOR THE EXAMPLES (a) AND (b) ILLUSTRATED WOULD BE ON AN EXCLUSIVITY BASIS IF SITE X IS COMMON TO BOTH.



(b)

RETURN PATH TYPICAL SERVICE AREA

FIG. 11(b)

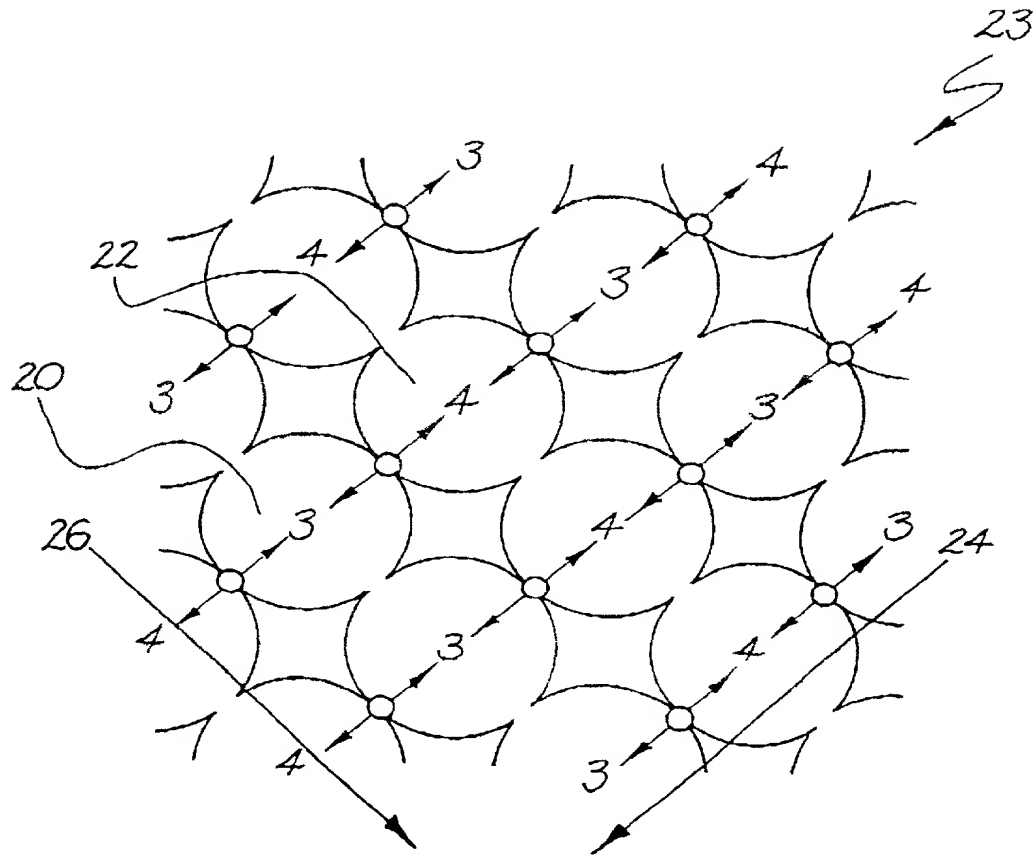


FIG. 12(a)



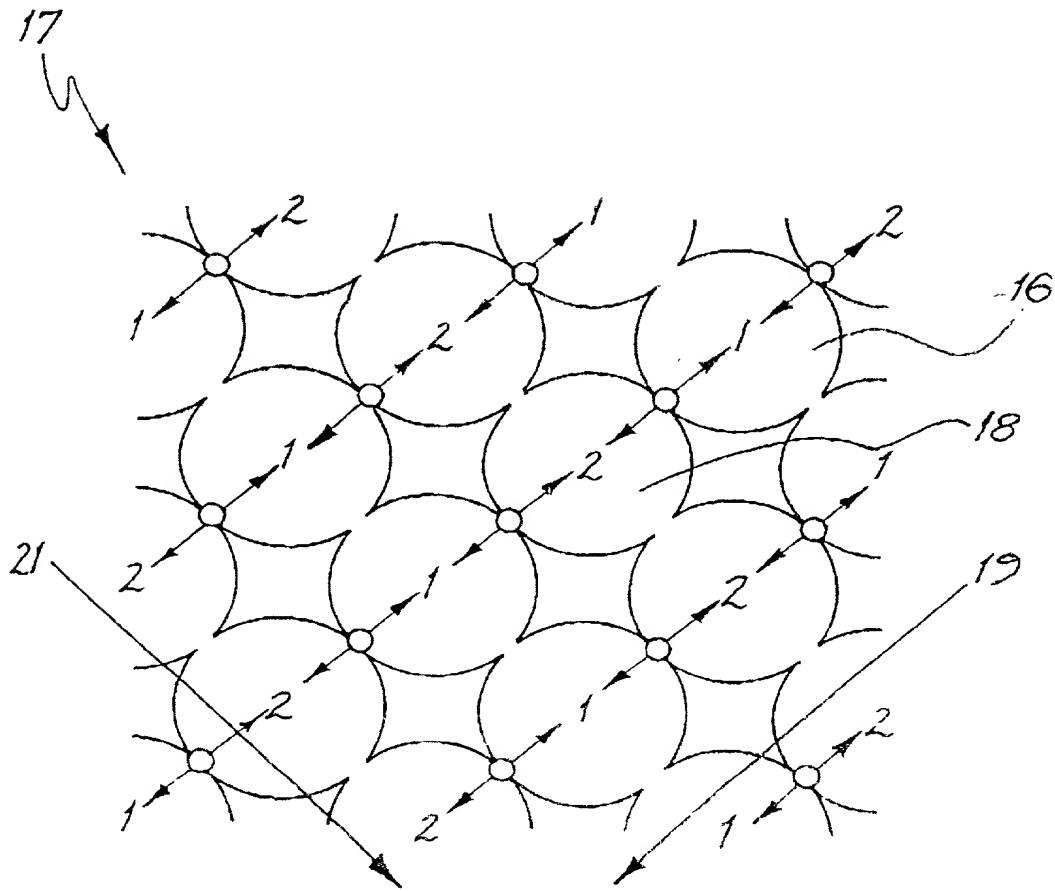


FIG. 12(b)